38-01-01

Speed Control and Anti-Skid Control

GROUP 38

PART 38-01 *General Speed Control and Anti-Skid Control Service*

A visual inspection is an important part of each system test. When performing a visual inspection, check all items for abnormal condition, check all items for such as frayed wires, loose connections or damaged vacuum hoses.

For the speed control system to function properly, it is necessary that the speedometer cables be properly routed and securely attached to the components. All vacuum hoses must be securely attached and routed with no sharp bends or kinks. The servo and throttle linkage should operate freely and smoothly.

It is important that the hydraulic line connections are tight and free from leakage on the anti-skid control system. Electrical connections on both systems must be complete and tight. The wiring harness must be properly routed. Look for frayed insulation or evidence of shorts.

Any problems revealed by the visual inspection should be corrected before further tests of the speed control or anti-skid control systems are made.

Refer to the Wiring and Vacuum Diagrams Manual Form 7795P-70 for electrical schematic wiring diagrams, vacuum schematic diagrams and the locations of wiring and vacuum harnesses and lines.

Refer to the Car Diagnosis Manual, Form FD 7962 for the dianosis procedures.

PART 38-02 *Bendix Speed Control System*

1 DESCRIPTION AND OPERATION

The Bendix speed control system is composed of the OFF-ON switch and the SET-ACC and COAST switches, a servo (throttle actuator) assembly, a speed sensor, an amplifier assembly and the necessary wires, linkage and vacuum hose to connect the components. The switches are located in the steering wheel spokes. The amplifier assembly and speed sensor are located under the instrument panel, and the servo assembly (throttle actuator) is attached to the dash panel under the hood.

To operate the Bendix speed control system the engine must be running and the vehicle speed between 30 to 80 mph. Manifold vacuum is constantly supplied when the engine is running. When the on/off switch in the steering wheel is actuated to the **ON** position the system is made ready to accept a **set speed** signal. When the vehicle has been accelerated and stabilized at a speed over 30 mph and the **ON** switch engaged, the operator may quickly depress and release the set/accelerate button. This speed will be maintained until a new speed is set by the operator, the brake pedal is depressed, or the system is turned **OFF.**

DECREASING SET SPEED

The rate of set speed may be reduced by applying the brake and then resetting the speed using the preceding method or by depressing the coast switch. When the vehicle has slowed to the desired speed the coast switch is released and the new speed is set automatically. **If the vehicle speed is reduced below 30 mph, the operator must manually increase the speed and reset the system.**

INCREASING SET SPEED

The vehicle set speed may be increased at any time by depressing the accelerator until the higher rate is reached and stabilized, then depressing and releasing the set speed button.

Speed may also be increased by depressing the set/accelerate switch button (at speeds over 30 mph) and holding it in that position. The vehicle will then automatically increase speed. When the desired rate of speed is attained and the button is released, that new set speed will be maintained.

2 TESTING

VISUAL INSPECTION

A visual inspection is an important part of the system test. When performing a visual inspection, check all items for abnormal conditions such as frayed wires and damaged vacuum hoses. For the speed control system to function properly, it is necessary that the speedometer cables be properly routed and securely attached to the components. All vacuum hoses must be securely attached and routed with no sharp bends or kinks. The servo (throttle actuator) and throttle linkage should operate freely and smoothly. Electrical connections must be complete and tight. The wiring harness must be properly routed. Look for frayed wiring insulation or evidence of shorts.

Any problems revealed by the visual inspection should be corrected before further tests of the speed control system are made.

SPEED SENSOR TEST

Disconnect the speed sensor wires from the amplifier assembly, and connect an ohmmeter between the speed sensor wire connector terminals (green and black). A reading of approximately 400 ohms should be obtained. If the ohmmeter records 400 ohms and the speedometer operates properly, the speed sensor is probably good. A speed sensor of known good quality can also be substituted in place of the existing sensor to check for proper operation.

SERVO ASSEMBLY (THROTTLE ACTUATOR) TEST

Disconnect the ball chain from the throttle linkage. Separate the actuator to amplifier connector. Connect an ohmmeter between the orange and grey wire leads at the actuator connector. A resistance of approximately 85 ohms should be obtained. Connect the ohmmeter between the orange and white wire leads. A resistance of approximately 85 ohms should be obtained.

Start the engine and connect the orange lead to the battery positive terminal. Connect the white lead to ground, and momentarily touch the grey lead to ground. The servo throttle actuator should tighten the bead chain and open the throttle. The throttle should hold in that position or slowly release the tension on the chain. When the white wire is removed from ground, the actuator should release the bead chain tension immediately. Replace the actuator if it fails any part of the preceeding test. **If the orange lead is shorted to either the white or grey leads, it may be necessary to replace the amplifier.**

AMPLIFIER ASSEMBLY TEST

Disconnect the amplifier assembly and install an amplifier assembly of known quality in its place. **Be sure that the new amplifier is grounded.** If the speed control system works properly with the new amplifier, the old amplifier is not working properly and should be replaced. **Do not subsitute a new amplifier for the old amplifier until the actuator coils have been tested.** Refer to the Servo Assembly (Throttle Actuator Test).

CONTROL SWITCHES TEST

Disconnect the blue lead going to the amplifier from the control switches. Then, check the blue lead from the control switches as follows:

1. Check for battery voltage at the blue lead when the ON switches is depressed. Battery voltage should be available at the blue lead coming from the control switches. (Refer to the wiring diagram in Fig. 1).
2. Connect an ohmmeter between the blue wire and ground. Check the blue wire for continuity to ground when the OFF switch is depressed. If a resistance is found, the wiring slip rings or the switch is at fault and should be replaced.
3. With an ohmmeter connected between the blue wire and ground, depress the set-speed switch. A reading of approximately 680 ohms should be indicated on the ohmmeter (Fig. 1).
4. With an ohmmeter connected between the blue wire and ground, depress the coast switch. A reading of approximately 120 ohms should be indicated on the ohmmeter.

3 ADJUSTMENTS

LINKAGE ADJUSTMENT

Adjust the bead chain to obtain 0.06-0.25 inch actuator arm free travel when the engine is at hot idle (Fig. 6 or 9). The adjustment should be made to take as much slack out of the bead chain as possible **without restricting the carburetor lever from returning to idle.** The tighter the bead chain the better performance on the speed control.

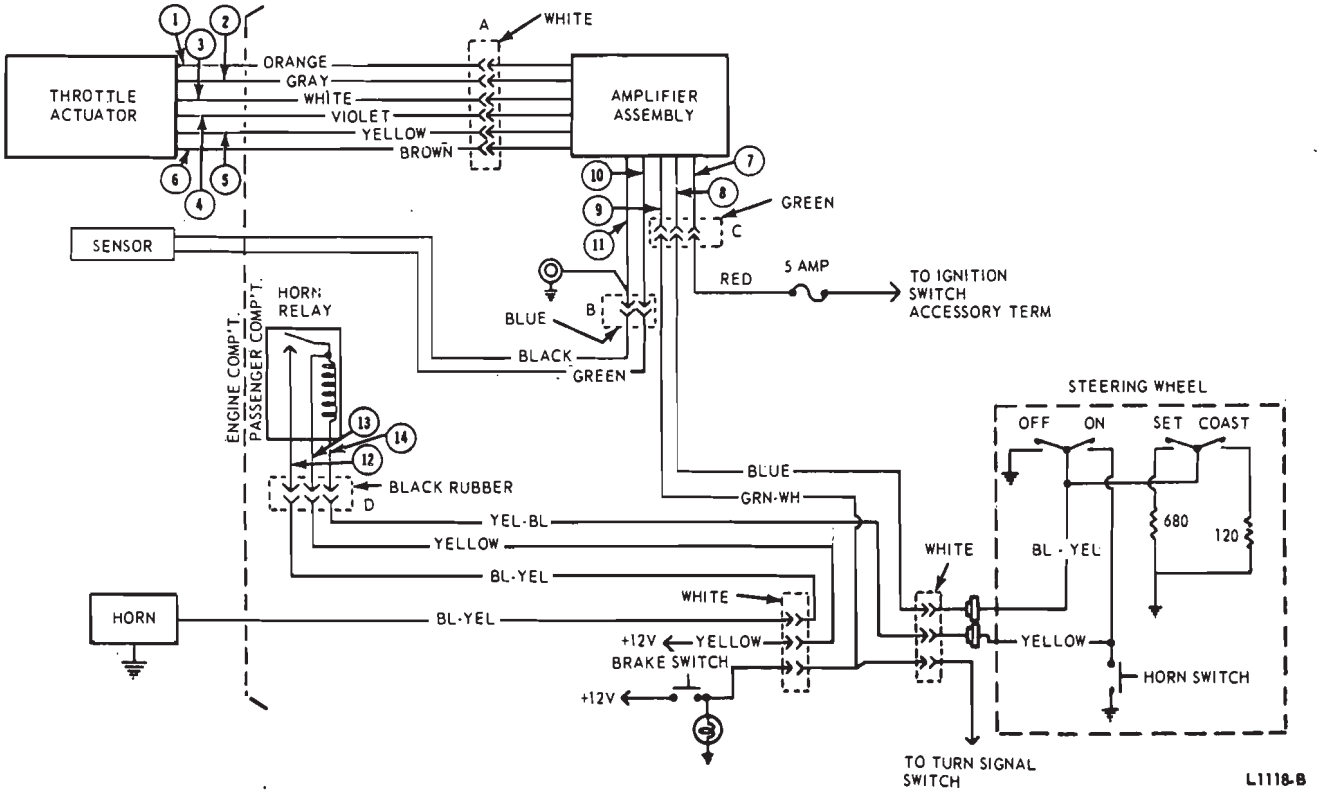

FIG. 1—Bendix Speed Control System Wiring Diagram—Ford, Mercury, Meteor and Thunderbird

4 REMOVAL AND INSTALLATION

CONTROL SWITCHES—FORD, MERCURY AND METEOR

REMOVAL

1. Remove the switch bezels by carefully prying up with a thin knife blade (Fig. 2).
2. Remove the center trim plate.
3. Remove the two screws attaching the high foam pad to the steering wheel spokes and remove the high foam pad.
4. Remove the three screws attaching the switch to the steering wheel.
5. Remove the wire plug connector from the switch and discard the old switch.

INSTALLATION

1. Install the wire plug connector on the new switch and attach the switch with the three existing screws.
2. Install the high foam pad and attach it with the two existing screws.
3. Install the center trim plate and the switch bezels.

CONTROL SWITCHES—THUNDERBIRD

REMOVAL

1. Remove the two retaining screws holding the high foam pad assembly to the steering wheel.
2. Lift up the pad assembly to expose the horn and speed control wire terminals. Disconnect and remove the pad assembly.
3. Remove the two retaining screws holding the high foam pad to the trim pad containing the speed control switches.
4. The speed control switches may now be removed by snapping the switches out of the plastic retainer (Fig. 3).

INSTALLATION

1. Snap the switch into the plastic retainer portion of the trim pad running the wires to the center hole as removed.
2. Attach the trim pad to the high foam pad with the two screws.
3. Attach the wires to the steering wheel hub and the high foam pad to the steering wheel with the two retaining screws.

CONTACT RING AND INSULATOR ASSEMBLY

REMOVAL

1. Remove the switch bezels from the steering wheel by carefully prying up with a thin knife blade (Fig. 2 or 3).
2. Remove the center trim plate and the pad from the steering wheel.
3. Remove the steering wheel from

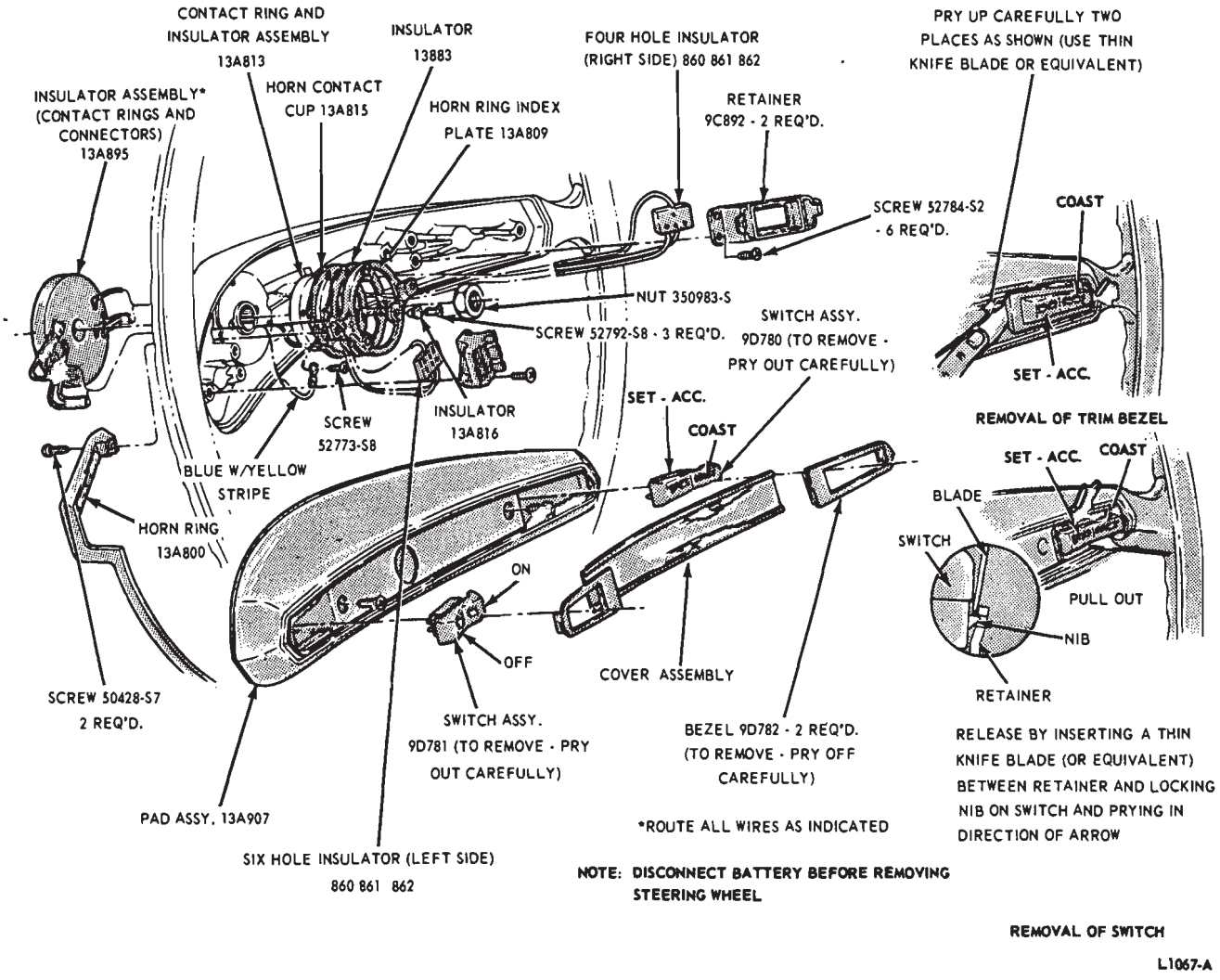

FIG. 2—Steering Wheel Mounted Controls—Ford, Mercury, Meteor and Thunderbird

the steering shaft (Refer to Shop Manual, Part 13-02). **Use care not to lose the brush assembly (Fig. 4 or 5) on vehicles with a fixed steering column.** This brush is used only with speed control.

4. Remove the horn ring from the index plate.

5. Remove three index plate attaching screws and insulators.

6. Unplug the wires from the OFF-ON and SET-ACC and COAST switches.

7. Remove two screws attaching the contact ring and insulator assembly to the steering wheel, and remove the assembly.

INSTALLATION

1. Position the contact ring and insulator assembly to the steering wheel and install the attaching screws. Connect the wires to the speed control switches (Fig. 2 or 3).

2. Install the index plate, insulator, rubber bushing, and the horn contact cup.

3. Install the steering wheel and pad.

4. Install the center trim plate and switch bezels.

GROUND BRUSH ASSEMBLY—(FIXED COLUMN ONLY)

This brush is used to ground the outer slip ring in the steering wheel. On tilt columns the ground is furnished through the steering column bearing to the steering wheel hub through the steering shaft. The brush is therefore not necessary on tilt column equipped vehicles.

REMOVAL

1. Remove the steering wheel for access. Refer to Shop Manual, Part 13-02 for the steering wheel removal procedure.

2. Snap the brush assembly out of the turn signal switch (Fig. 4 or 5).

INSTALLATION

1. Install the ground brush in the turn signal switch. (If the turn signal switch was lifted off the column when removing the ground brush, install the turn signal switch.)

2. Install the steering wheel trim pads and the steering wheel.

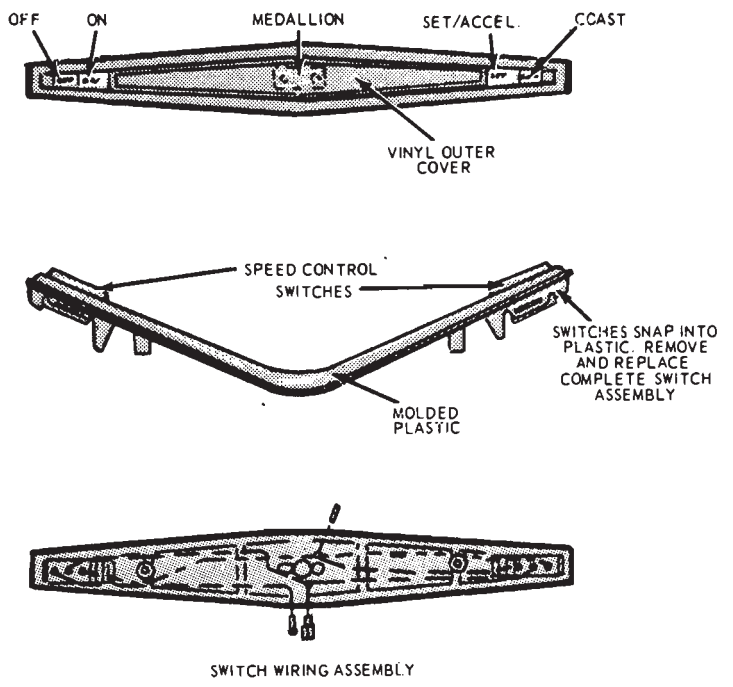

FIG. 3—Control Switch Removal—Thunderbird

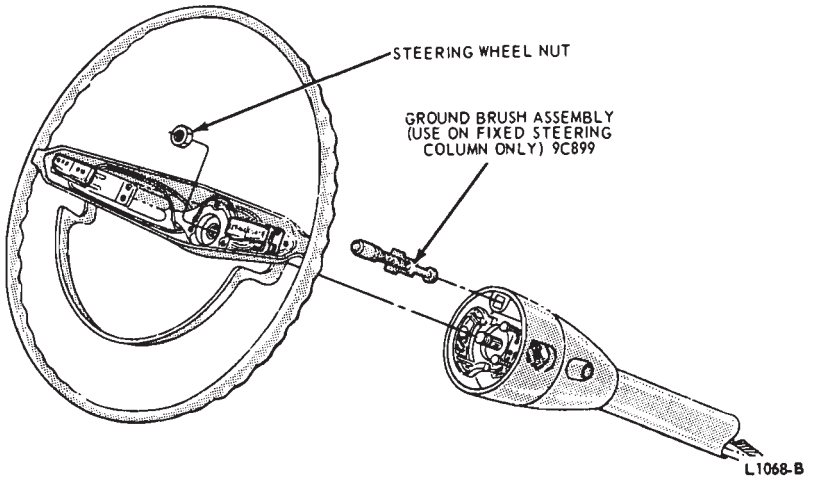

FIG. 4—Steering Wheel Installation—Ford, Mercury and Meteor

SPEED SENSOR-FORD, MERCURY AND METEOR

REMOVAL

1. Separate the electrical connector leading to the amplifier assembly (Fig. 6).
2. Disconnect the upper and lower speedometer cables at the speed sensor.
3. Remove the speed sensor mounting bracket nut.
4. Remove the speed sensor assembly from the mounting bracket.

INSTALLATION

1. Insert the speed sensor in the mounting bracket (Fig. 6).
2. Install the speed sensor mounting bracket nut.
3. Connect the upper and lower speedometer cables.
4. Connect the electrical connector leading to the amplifier assembly.

SPEED SENSOR—THUNDERBIRD

REMOVAL

1. Separate the blue electrical connector leading to the amplifier assembly in the passenger compartment (Fig. 7).
2. Disconnect the upper and lower speedometer cables at the speed sensor in the engine compartment (Fig. 7).
3. Remove the four attaching screws holding the sensor retaining bracket to the dash panel.
4. Remove the grommet in the dash panel.
5. Carefully pull the harness and connector through the dash panel, from the passenger compartment.
6. Remove the speed sensor.

INSTALLATION

1. Attach the speed sensor and sensor bracket to the dash panel with the four attaching screws (Fig. 7).
2. Connect the upper and lower speedometer cables.
3. Install the dash panel grommet on the wire harness.
4. Route the wire harness to the amplifier assembly through the dash panel into the passenger compartment and install the grommet in the dash panel.
5. Attach the blue electrical connector to the amplifier connector (Fig. 8).
6. Test the system for proper operation.

AMPLIFIER ASSEMBLY

REMOVAL

1. Disconnect the speed sensor, servo assembly (throttle actuator), horn relay and the amplifier assembly wire harness connectors (Fig. 8).
2. Remove the two attaching bolts that fasten the amplifier assembly mounting bracket to the dash panel.
3. Remove the amplifier assembly and mounting bracket from the vehicle.
4. Remove the amplifier assembly from mounting bracket.

INSTALLATION

1. Install the amplifier on the mounting bracket.
2. Attach the amplifier assembly and mounting bracket to the dash panel with the two attaching screws

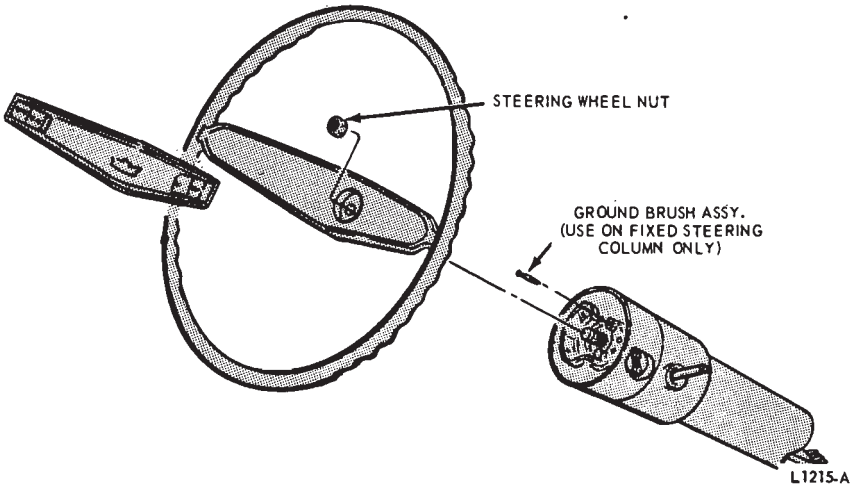

FIG. 5—Steering Wheel Installation—Thunderbird

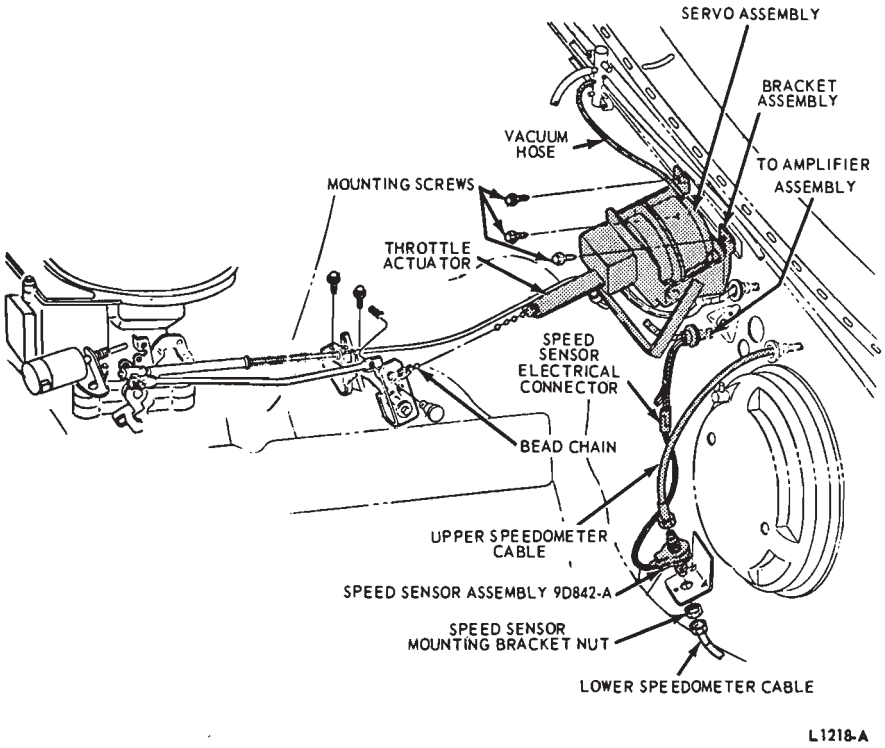

FIG. 6—Speed Control Sensor and Servo Assembly—Ford, Mercury and Meteor

(Fig. 8).

3. Connect the speed sensor, servo assembly (throttle actuator), horn relay, and the amplifier assembly wire harness connectors.

4. Test the system for proper operation.

SERVO ASSEMBLY (THROTTLE ACTUATOR) FORD, MERCURY, METEOR AND THUNDERBIRD

REMOVAL

1. Disconnect the wiring harness connector under the instrument panel at the amplifier (Fig. 6 or 9).

2. In the engine compartment, remove the grommet from the dash panel and carefully pull the harness and connector through the dash panel opening.

3. Disconnect the ball chain at the bell crank (Fig. 6 or 9). Disconnect the vacuum hose at the servo assembly.

4. Remove the screws retaining the servo assembly to the dash panel. Remove the servo assembly.

INSTALLATION

1. Position the servo assembly to the dash panel. Install the retaining screws and connect the vacuum hose (Fig. 6 or 9).

2. Route the lead through the dash panel and push the grommet in place.

3. Under the instrument panel, connect the servo assembly connector to the amplifier (Fig. 8).

4. In the engine compartment connect the chain to the bell crank. Refer to Section 3, Adjustments.

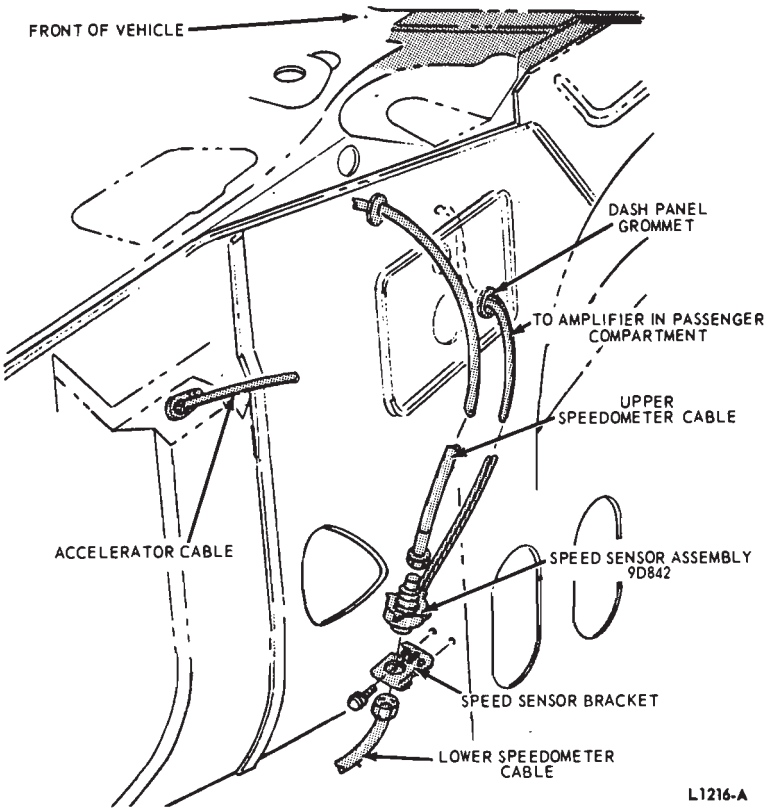

FIG. 7—Speed Control Sensor—Thunderbird

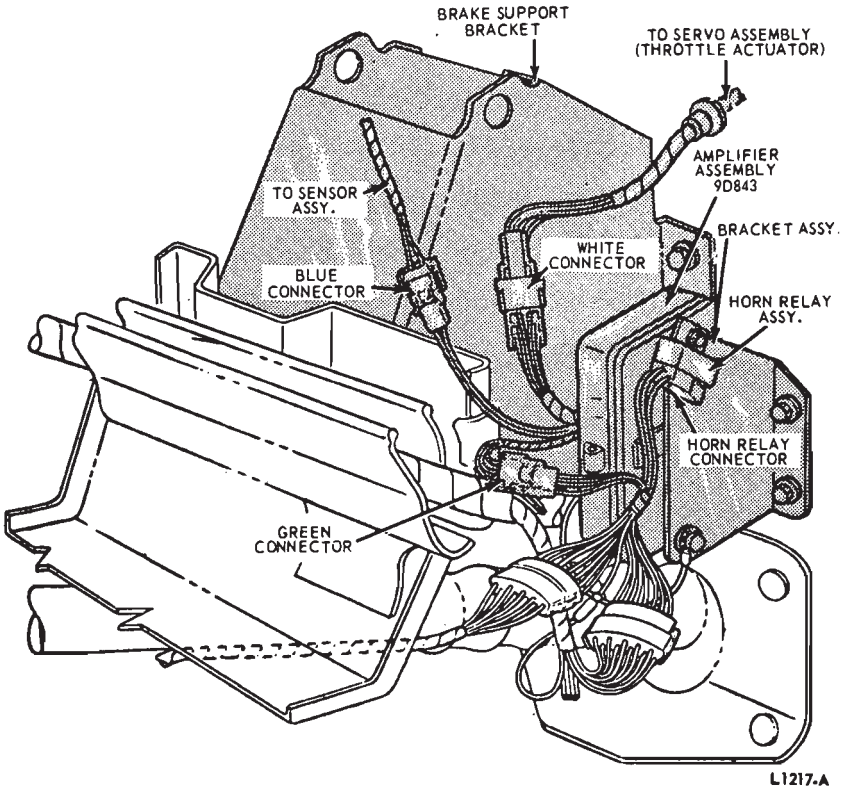

FIG. 8—Speed Control Amplifier Assembly

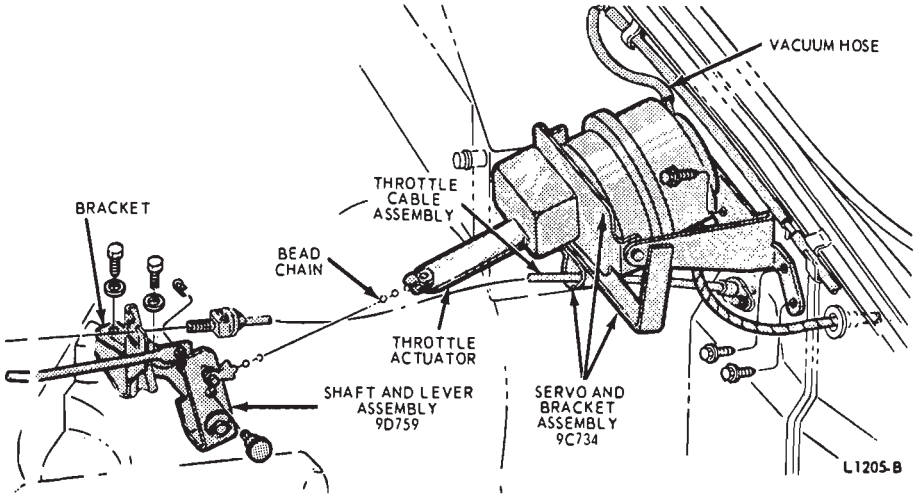

FIG. 9—Servo Assembly (Throttle Actuator)—Thunderbird

PART 38-03 *Perfect Circle Speed Control System*

1 DESCRIPTION AND OPERATION

The perfect circle speed control system consists of a speed control regulator assembly, a brake release relay, an ON-OFF switch, an ON-OFF switch holding (control) relay, a two position turn signal lever (set-speed) switch, a servo assembly (bellows), upper and lower speedometer cables, and the necessary wires, vacuum hoses, and linkage to connect the components for proper operation.

When the ignition switch is ON and the speed control ON switch is depressed, electrical power is supplied to the holding (control) relay the turn signal lever set-speed switch and the speed control regulator assembly.

Vehicle speed is transmitted to the governor in the regulator assembly with a speedometer cable which is connected to the vehicle transmission. As the speed of the vehicle reaches approximately 30 mph, the governor causes the low speed inhibit switch contacts to close. This makes the speed control system ready for operation.

When the vehicle was attained approximately 30 mph or faster, the turn signal lever set-speed switch button should then be depressed to the first detent for speed control operation. When the set-speed switch button is depressed to the first detent, the throttle opening and vehicle speed will increase.

After the desired vehicle speed has been reached, the set-speed switch button should be released.

If the vehicle speed is reduced as when climbing a hill, the speed control regulator will collapse the throttle servo bellows and increase the carburetor throttle plate opening and vehicle speed. If the vehicle speed is increased, as when descending a hill, the reaction of the speed control regulator is the opposite. This allows more atmospheric air to enter the bellows and reduce vehicle speed to the speed setting.

When the brake pedal is depressed, the speed control regulator loses control of the throttle servo bellows. This

releases the carburetor to manual control by the accelerator pedal.

The coast position (second detent) of the set-speed switch also disengages the speed control regulator to reduce vehicle speed. When the set-speed switch button is released from the coast position, the switch contacts travel through the speed set position and again energize the speed control system. This automatically sets the speed control system for the speed of the vehicle at the time of release, providing the speed of the vehicle is not less than approximately 30 mph.

2 TESTING

VISUAL INSPECTION

A visual inspection is an important part of the system test. When performing a visual inspection, check all items for abnormal conditions such as frayed wires, loose connections or damaged vacuum hoses. For the speed control system to function properly, it is necessary that the speedometer cable be properly routed and securely attached to the components. All vacuum hoses must be securely attached and routed with no sharp bends or kinks. The servo and throttle linkage should operate freely and smoothly. Electrical connections must be complete and tight. The wiring harness must be properly routed. Look for frayed insulation or evidence of shorts.

Any problems revealed by the visual inspection should be corrected before further tests of the speed control system are made.

ROAD TEST

Road test the vehicle as follows to obtain a good test of the speed control problem.

1. Start the engine and move the ON-OFF switch to the ON position.
2. Accelerate the vehicle to 35 mph and push the set-speed button to the first detent. The speed control system should control the vehicle speed.
3. Push the set-speed button all-the-way in. The vehicle should slow down. When the vehicle speed slows to 30 mph, release the set-speed button. The speed control unit should start to control the speed at about 30 mph.
4. Depress the brake pedal. The speed control system should be cancelled.

ROAD TEST RESULTS

The failures of the regulator assembly will generally be the following:

1. The vehicle continues to accelerate slowly instead of maintaining a constant speed.
2. Vehicle hunts or will not maintain the set speed but will oscillate slowly around that speed.
3. The speed control system will not lock in at any speed when all other system components are OK.

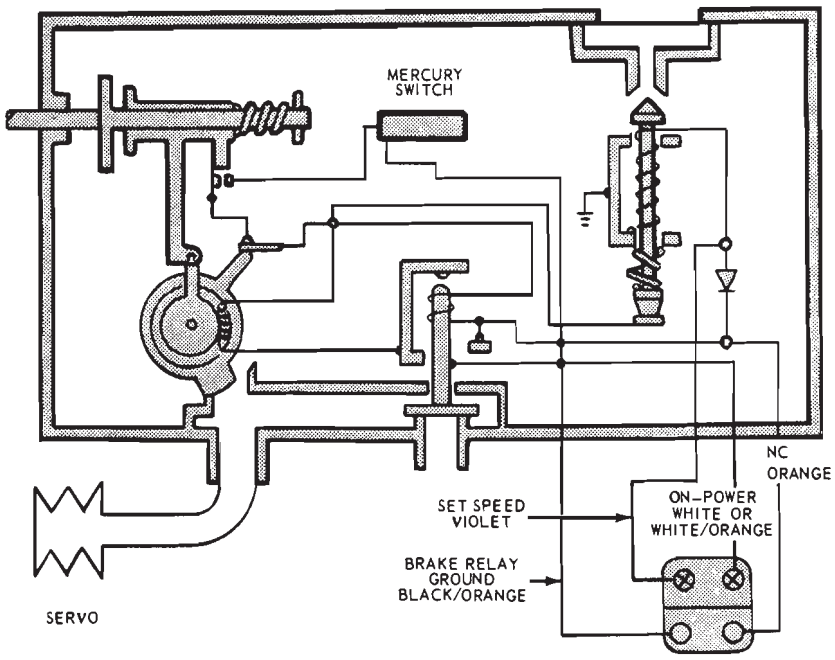

FIG. 1—Perfect Circle Speed Control Regulator—Schematic Wiring Diagram

SIMULATED ROAD TEST

If at any time during the following steps the system should appear to go out of control and over-speed, be prepared to turn the system off at once with the OFF switch or the ignition switch.

1. Raise the rear wheels clear of the floor.
2. Start the engine.
3. Shift the transmission to Drive.
4. Turn on the speed control.
5. Accelerate and hold at 35 mph.
6. Press and release the set speed button. Hold foot pressure very lightly on the accelerator pedal. Normally the speed will continue at 35 mph for a short period of time and then gradually start surging.
7. Press the off button. The engine should drop back to idle. Stop the rear wheels with the brakes.
8. Press the ON button, accelerate and hold the speed at 35 mph.
9. Press and hold the set speed button. Slowly remove the foot from the accelerator. The engine speed should gradually increase.
10. When the speed reaches 45 mph, release the set speed button. The surging should start soon.

11. Press the COAST button or the set speed button to the coast position and hold. The engine should idle. Slow the rear wheels to 35 mph with the brakes.

12. Release the COAST button or the set speed button. Speed should set in. Surging should soon start.

13. Press the brake pedal. The system should shut off, the engine should idle and the brakes stop the wheels.

REGULATOR ASSEMBLY TEST

Before making this test, make sure there is engine vacuum at the regulator.

1. Remove the servo vacuum hose from the regulator.
2. Attach a vacuum gauge to the regulator servo vacuum connector.
3. Disconnect the regulator from the wiring harness.
4. Check the case of the regulator for a good ground. Repair it if required. Ground the brake release relay wire terminal.
5. Apply battery power to the terminal of the regulator (Fig. 1).
6. With the rear wheels raised, establish vehicle speed of 35 mph. This closes the inhibit switch.
7. Apply power to the set speed circuit terminal(s) of the regulator connector. Vacuum should show on the gauge and increase to approximate manifold pressure. If no vacuum, replace the regulator.
8. Reduce the speed to 20 mph. The vacuum gauge should show no vacuum. If not O.K., replace the regulator.
9. Momentarily apply power to the set speed terminal(s). Increase speed to 40 mph. Vacuum should show on the gauge. Vary the speed between 35 and 45 mph. Vacuum reading on the gauge should vary. As speed increases, the vacuum should drop. As speed decreases the vacuum should go up. If action is not correct, replace the regulator.

ON-OFF SWITCH AND CONTROL RELAY TEST—CONTINENTAL MARK III

1. Turn the ignition switch to the accessory position.
2. Move the ON-OFF switch to the ON position. If the speed control indicator light remains ON, the ON-OFF control relay is energizing and it is functioning properly.
3. If the indicator light does not stay ON, check for voltage at the control relay red wire. Voltage should be available at the red wire when the ON-OFF switch is actuated and when the ON-OFF switch is released.
4. If voltage is not available at the red wire when the switch is released, check for voltage at the yellow wire. If voltage is available at the yellow wire, replace the control relay.
5. If voltage is available at the red wire, connect a test light between the green and yellow terminals of the ON-OFF switch. If the test light glows, this part of the switch is OK. If the light does not glow, replace the switch.
6. Turn the switch off. The light should go out. If it does not go out, replace the switch.
7. Connect the test light between the green and red terminals of the ON-OFF switch. The test light should not glow. If it does glow, replace the switch. Turn the switch on. The test light should glow. If it does not glow, replace the switch.

TURN SIGNAL LEVER SET-SPEED SWITCH TEST

1. Disconnect the set-speed switch connector wire connector at the base of the steering column.
2. With the switch in the normal out position, check for continuity (with ohmmeter or self powered test light) between the connector terminals. There should be continuity between the red terminal of the connector and the violet wire terminal. There should be no continuity between the violet and white (white/orange) wire terminals.
3. Depress the switch to the frist detent, there should be continuity between the red terminal of the connector and the violet and white (white/orange) wire terminals. There should also be continuity between the violet and white (white/orange) terminals.
4. Depress the switch all the way. There should be no continuity between any of the terminals.

BRAKE RELEASE RELAY TEST—LINCOLN CONTINENTAL

1. Disconnect the brake release relay at the quick disconnect. (The relay is mounted on the speed control regulator bracket in the engine compartment Fig. 5).
2. Connect an ohmmeter or self powered test light between the black-orange wire relay terminal and ground. There should be no continuity. If there is continuity, the relay is damaged.
3. Connect the red wire relay terminal to the battery positive terminal and the blue relay terminal wire to ground with jumper wires. The relay should click, and there should be continuity between the black-orange wire terminal and ground. If the relay does not fulfill these conditions, it should be replaced.

BRAKE RELEASE RELAY TEST—CONTINENTAL MARK III

1. Disconnect the brake release relay at the quick disconnect. (The relay is mounted on the speed control requlator bracket in the engine compartment Fig. 4).
2. Connect an ohmmeter or self powered test light between the black-orange wire relay terminal and ground. There should be continuity. If there is no continuity, the relay is damaged.
3. Connect the blue-white wire relay terminal to the battery positive terminal by a jumper wire. The relay should click, and there should be no continuity between the black-orange wire terminal and ground. If the relay does not fulfill these conditions, it should be replaced.

SPEED CONTROL HOLDING (CONTROL) RELAY TEST

Connect the test lamp between ground and the red wire terminal on the holding relay. With the ignition key in the ACC position and the ON button (in the ON-OFF panel) depressed, the test lamp should light.

If the test lamp fails to light and feed wire to holding relay proves good, then the holding relay is at fault and requires replacement.

SERVO (BELLOWS) ASSEMBLY TEST

1. Check the servo assem-bly for binding linkage and loose vacuum hose. Check the linkage for proper adjustment.
2. Disconnect the servo vacuum-hose at the speed-control regulator. Compress the servo bellows, hold the thumb over the end of the vacuum hose. Observe the servo assembly, the bellows should not expand (leak down).
3. If the bellows does leakdown, check the bellows hose forleaks, if it is OK, the servo assembly has a leak and should be replaced.

BRAKE STOPLIGHT SWITCH TEST

1. Disconnect the stoplight switch connector at the switch.
2. Connect an ohmmeter or self powered test light to the two switch terminals.
3. Depress the brake pedal. The switch should show continuity. If it does not it should be replaced.

3 ADJUSTMENTS

THROTTLE LINKAGE ADJUSTMENT

Adjust the servo chain to obtain a 1/2 to 1 ball link slack when the engine is at hot idle.

4 REMOVAL AND INSTALLATION

SERVO (BELLOWS) ASSEMBLY

REMOVAL

1. Remove the screws attaching the servo assembly to dash panel (Fig. 2 or 3).
2. Remove nut attaching servo assembly to bracket.
3. Remove the adjuster sleeve nut, locking nut and chain assembly from the vacuum servo and remove the vacuum servo.

INSTALLATION

1. Install the bracket on the new servo assembly and attach it with the existing nut.
2. Install the servo and bracket assembly to dash panel and attach with the existing screws.

Install lock nut, adjuster sleeve nut and chain assembly. **Adjust chain to maintain 1/2 to 1 ball link slack with engine on hot idle.**

BRAKE RELEASE AND/OR CONTROL RELAY—CONTINENTAL MARK III

REMOVAL

1. Disconnect the electrical wiring from the harness.
2. Remove the nuts and lockwasher securing the relay to the regulator assembly mounting bracket (Fig. 4).
3. Remove the relay.

INSTALLATION

1. Insert the relay studs through the holes provided in the mounting bracket and attach and tighten the lockwashers and nuts.
2. Connect the electrical wiring to the harness at the connector.

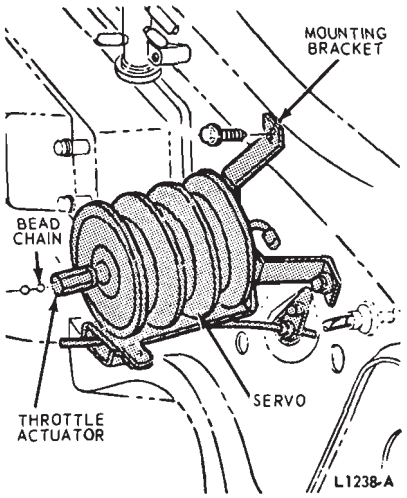

FIG. 2—Servo Assembly Removal—Lincoln Continental

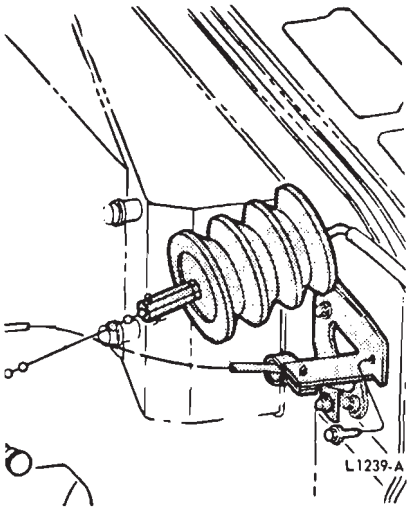

FIG. 3—Servo Assembly Removal—Continental Mark III

BRAKE RELEASE RELAY AND/OR HOLDING RELAY—LINCOLN CONTINENTAL

REMOVAL

1. Disconnect wires from harness at electrical connector (Fig. 5).
2. Remove two self-tapping screws and lift relay from mounting plate.
3. Remove the relay.

INSTALLATION

1. Secure the relay to its mounting plate with two self-tapping screws (Fig. 5).
2. Connect the wires to the harness at the electrical connector.

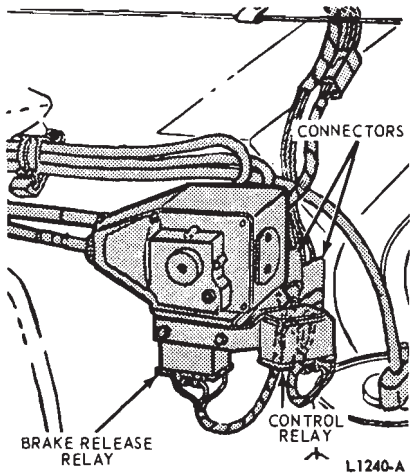

FIG. 4—Brake Release and Control Relays, Installation—Continental Mark III

REGULATOR ASSEMBLY

REMOVAL

1. Disconnect the wires at the multiple connectors located at the regulator assembly.
2. Disconnect the two vacuum hoses from the regulator assembly (Fig. 6).
3. Disconnect the two speedometer cables from the regulator assembly.
4. Remove the nuts retaining the regulator assembly mounting bracket to the left fender apron and remove the assembly. **If any spacer washers were used to level the regulator assembly, make sure they are relocated in the same position.**
5. Remove two screws attaching the regulator assembly to the mounting bracket, and separate the bracket from the regulator assembly.

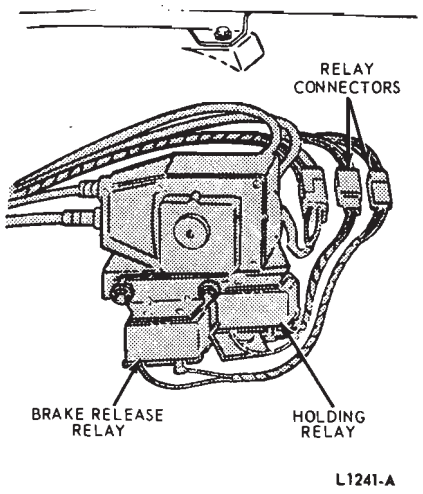

FIG. 5—Brake Release and Holding Relays, Installation—Lincoln Continental

INSTALLATION

1. The vehicle must be on a level surface.
2. Position the regulator assembly to the mounting bracket and install the two attaching screws.
3. Position the regulator assembly and the mounting bracket (Fig. 6) on the left fender apron. **Make sure the spacer washers used to level the regulator are properly located.**
4. Check the top surface of the regulator assembly for proper leveling. Either add to or reduce the number of spacers on either mounting bracket stud to establish the proper level.
5. Install the bracket retaining nuts.
6. Connect the speedometer cables to the regulator assembly.
7. Connect the vacuum hoses to the regulator assembly.
8. Connect the wires to the regulator assembly at the multiple connector.

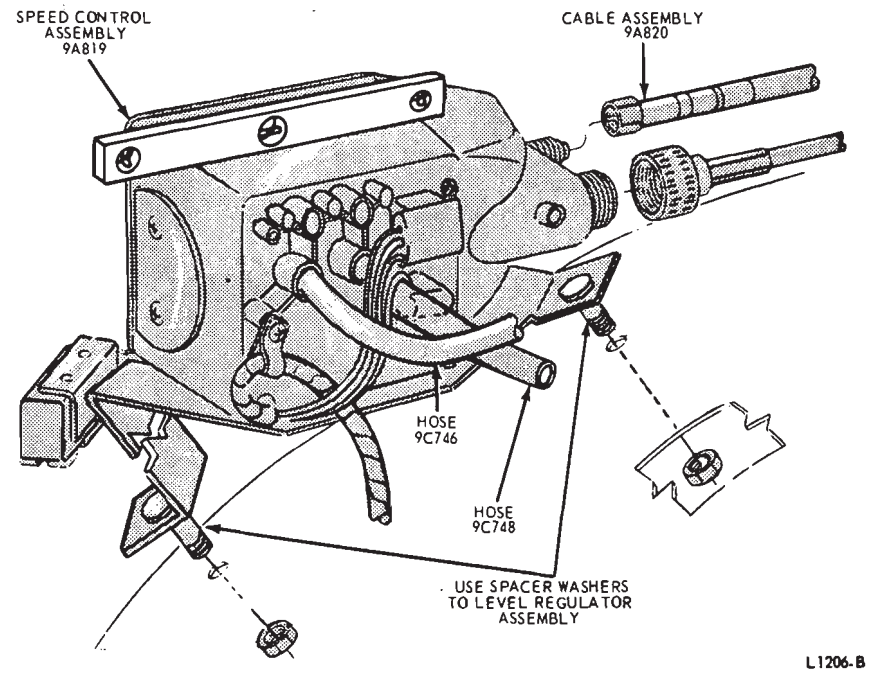

FIG. 6—Regulator Assembly Installation

ON-OFF SWITCH—LINCOLN CONTINENTAL

REMOVAL

1. Remove the three attaching screws and drop the switch retainer from the cluster hood (Fig. 7).
2. Disconnect the harness connector.
3. Remove the switch from the retainer assembly.

INSTALLATION

1. Install the switch in the switch retainer assembly (Fig. 7).
2. Connect the harness connector.
3. Position the switch retainer assembly to the cluster hood opening.
4. Install the three attaching screws.

ON-OFF SWITCH—CONTINENTAL MARK III

REMOVAL

1. Remove two screws attaching the switch and retainer to the underside of the cluster hood (Fig. 8).
2. Lower the switch and retainer and disconnect the wires at the multiple connector.

INSTALLATION

1. Connect the switch and indicator light wires at the multiple connector.
2. Position the switch and retainer to the cluster hood, and install the two attaching screws.

SET-SPEED SWITCH AND TURN SIGNAL LEVER—LINCOLN CONTINENTAL

REMOVAL

1. Disconnect the speed control set-speed switch wiring from green connector.
2. Remove the cover from the steering column hub on tilt column vehicles (Fig. 9).
3. Remove the wire harness retainer clip from the lower portion of the steering column.
4. Carefully pull the speed control switch wiring up through the steering column.
5. Unscrew the turn signal arm assembly.

INSTALLATION

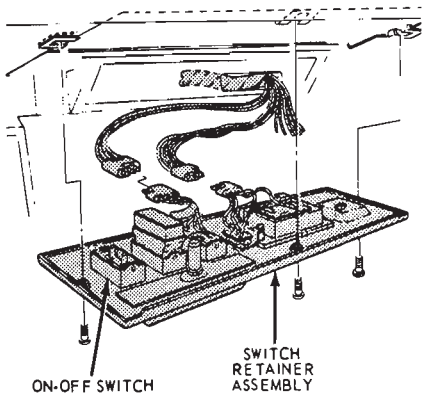

FIG. 7—ON-OFF Switch Installation—Lincoln Continental

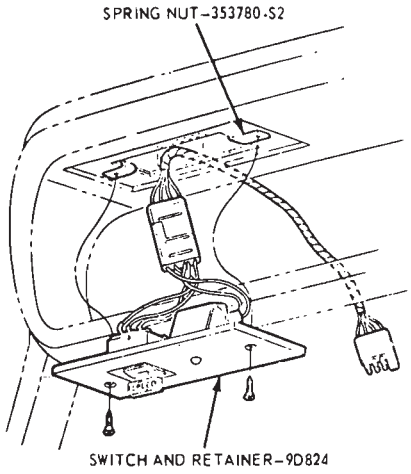

FIG. 8—ON-OFF Switch Installation—Continental Mark III

1. Tape the ends of the three speed control switch wires.
2. Install the turn signal arm assembly into the turn signal switch assembly (Fig. 9).
3. Feed the speed control switch wiring into the steering column wiring sleeve and remove tape from wire terminals.
4. Install the wire harness retainer clip in the lower portion of the steering column.
5. Install the cover on the steering column hub (if equipped with tilt column).
6. Connect the switch wiring connector.

SET-SPEED SWITCH AND TURN SIGNAL LEVER—CONTINENTAL MARK III

REMOVAL

1. Disconnect the wiring assembly

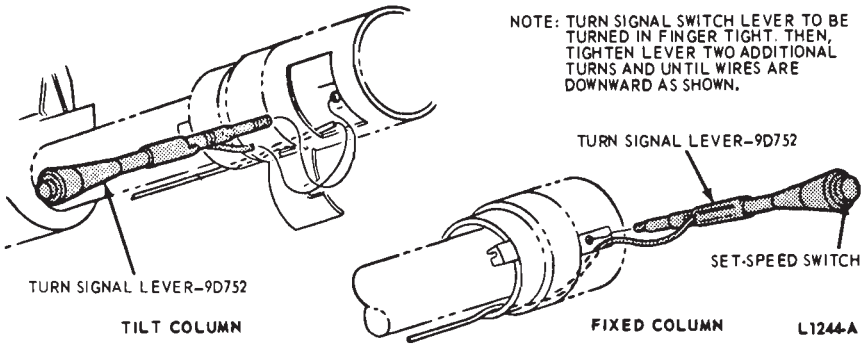

FIG. 9—Turn Signal Lever Installation

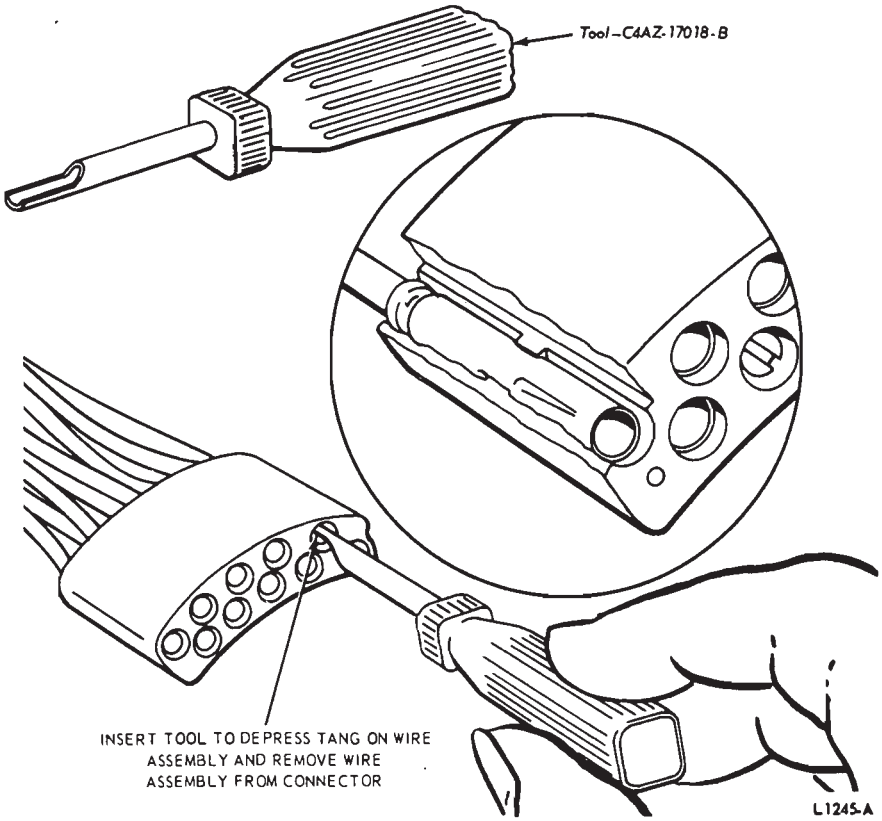

FIG. 10—Removing Wires From Connector

at the wire connector with the tool shown in Fig. 10. **Make a note of the connector and color code positions.**

2. Connect a pull cord to the turn signal lever wires.
3. Remove the wire cover from the underside of the steering column (fixed column only Fig. 9).
4. Pull the turn signal lever wires out of the steering column, and disconnect the pull cord from the wires.
5. Unscrew and remove the turn signal lever from the steering column.

INSTALLATION

1. Position the turn signal lever to the steering column and tighten finger tight. Then, tighten the lever two additional turns and until the wires are on the bottom side of the lever (Fig. 9).
2. Connect the pull cord to the wires, and thread the wires through the turn signal lever hole and route down the flange and into the turn signal wire trough.
3. Remove the pull cord from the wires, and insert the wires into the connector. **Refer to terminal location color code noted during removal.**
4. Install the wire cover on the lower side of the steering column (fixed column only).

PART 38-04 *Anti-Skid Control System*

1 DESCRIPTION AND OPERATION

DESCRIPTION

The anti-skid control system consists of three major components (Fig. 1). Mechanically driven electromagnetic sensors at each rear wheel; an electronic control module mounted under the glove box (Fig. 2); a vacuum powered actuator attached to a bracket on the inside of the right front frame rail under the toe board.

The sensors consist of steel rings having teeth on their outer diameters, pressed on each axle shaft just outboard of the wheel bearing (Fig. 3). The teeth rotate past corresponding teeth on the inside diameter of stationary steel rings mounted in the bearing retainers. Also mounted in the retainers, are ring-shaped permanent magnets and coils of wire. Two wires from each sensor connect the sensors to the control module.

The control module consists of solid state electronic components sealed in a container. It is connected to the sensors and to a solenoid on the actuator.

The actuator is similar in appearance to a vacuum brake booster and consists of three parts (Fig. 4): a chamber divided by a vacuum suspended diaphragm; a hydraulic cylinder connected to the diaphragm; and a solenoid connected electrically to the control module.

OPERATION

When the rear wheels rotate, AC voltage impulses generated by the sensors are transmitted to the module. The module receives these signals in the form of current and continually monitors rear wheel speed. The module operates on the sum of the signals from both rear wheels. When the sum of the signals drops abruptly below a pre-determined level due to rapid deceleration (a result of a maximum braking condition) the module sends an electrical signal to the actuator solenoid to release and reapply the rear brakes. This cycle of events occurs at a rate of up to 4 cycles per second until the vehicle speed drops to about 4 miles per hour or until the brakes are released by the driver.

NORMAL POSITION

When the anti-skid control feature is not operating the actuator is in the normal position (Fig. 5). In this position the solenoid valve is not energized. The solenoid valve spring holds the solenoid valve against the atmospheric air port and prevents air from entering the vacuum chamber. The front side of the diaphragm draws vacuum, and vacuum goes past the solenoid valve to the rear side of the diaphragm. The spring holds the diaphragm rearward. The front and rear brakes operate normally when the actuator is in the normal position. The rear brakes function normally through the actuator hydraulic brake chamber. The inlet port check valve is held open by the actuator piston rod.

ACTIVATED POSITION

When the module sends an electrical signal to the actuator solenoid, the following series of events take place. The energized solenoid moves the solenoid valve to close the vacuum passage to the rear side of the dia-

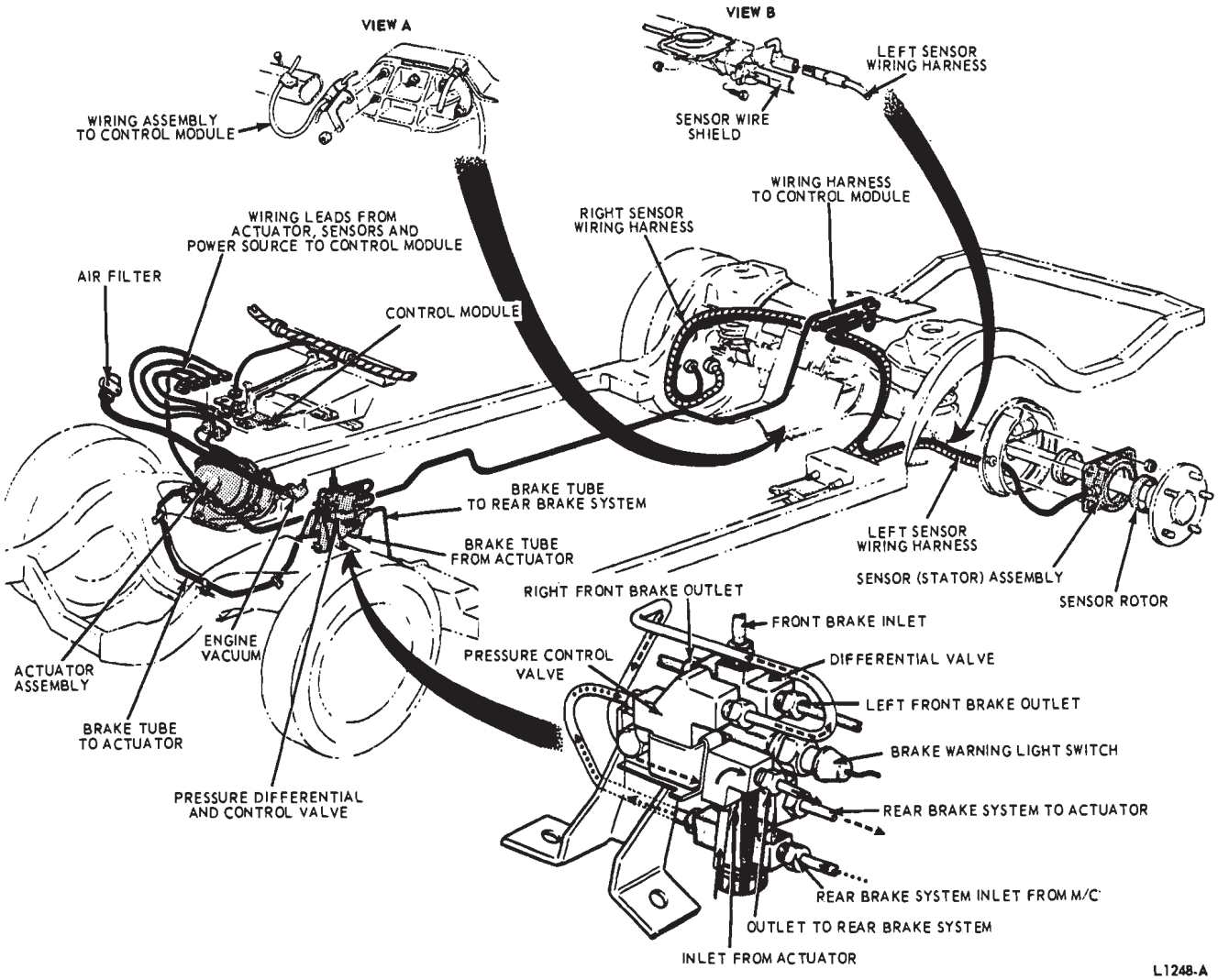

FIG. 1—Anti-Skid Control System

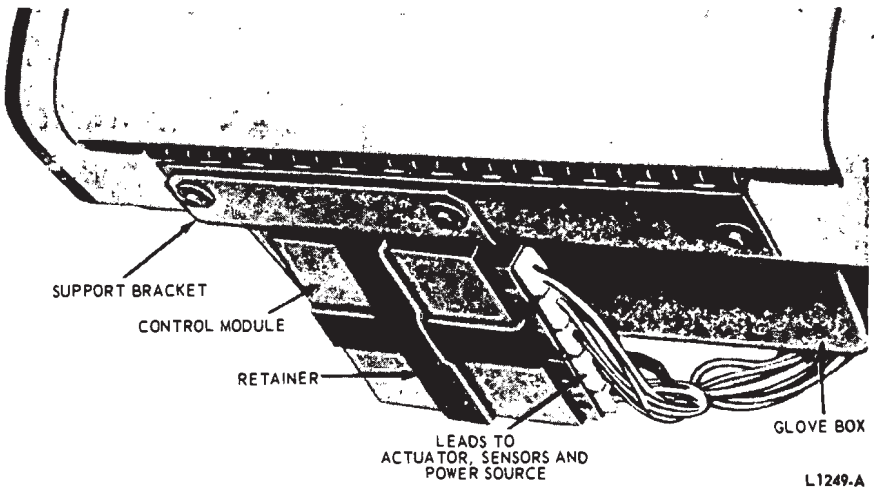

FIG. 2—Control Module Installation

phragm. The rear side of the diaphragm is now opened to atmospheric air. This results in a difference in pressure on the two sides of the diaphragm. This pressure differential overcomes the spring and forces the diaphragm forward. The hydraulic chamber piston rod moves forward and the brake chamber check valve is closed. The volume of the pressure chamber increases reducing the line pressure, and the rear brakes are released. With the actuator in the activated position the rear brakes are isolated from the rest of the system. As the rear wheel revolutions increase the module shuts off the electrical signal and de-energizes the solenoid. The solenoid valve returns to its original position, atmospheric air is shut off, vacuum is again drawn behind the di-

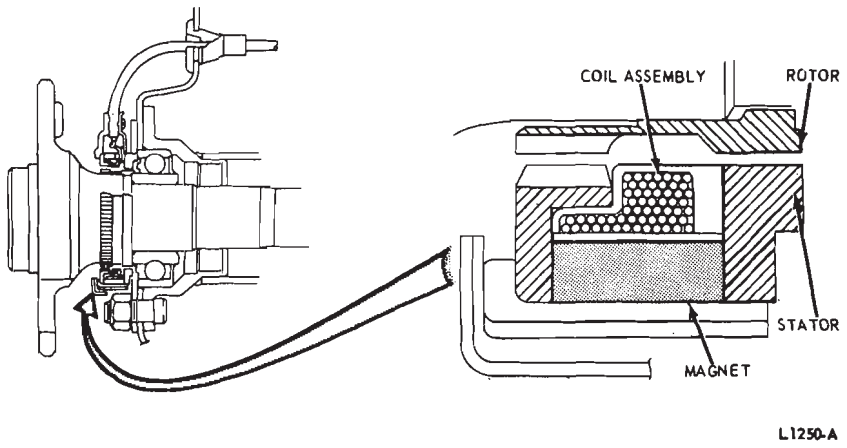

FIG. 3—Sensor Assembly, Cross-Sectional View

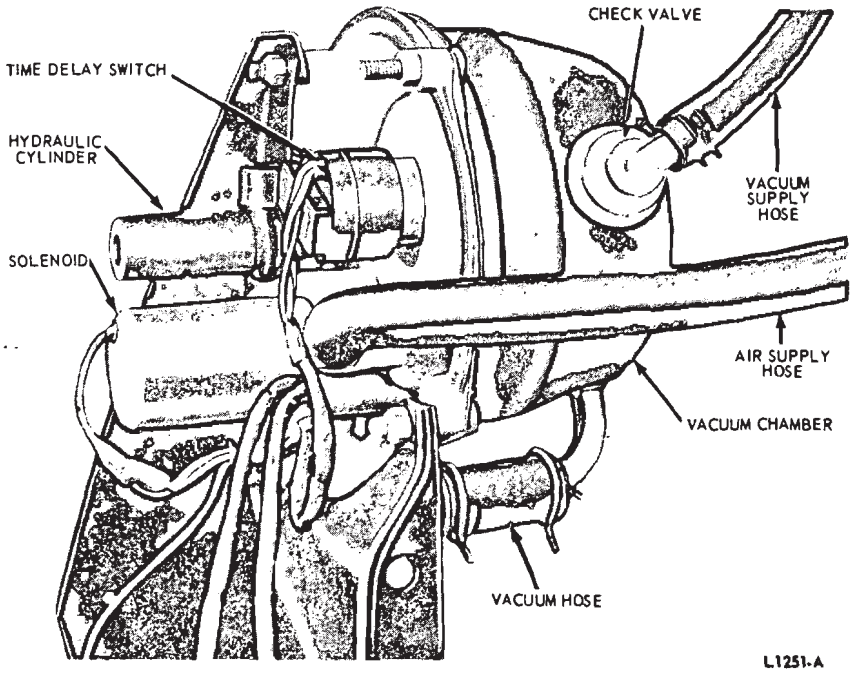

FIG. 4—Actuator Assembly Components

aphragm, the spring returns the diaphragm rearward, the brake chamber piston rod moves back in the pressure chamber, the brake chamber check valve opens and the rear brake pressures is re-applied (normal position). The actuator continues this cycle up to four times per second. This cycle of events causes the rear brakes to release, re-apply, release, reapply until the vehicle speed is down to about four miles per hour or until the brakes are released by the driver.

The time delay switch mounted on the actuator will cause the fuse to blow and the brake warning light to come on if the diaphragm remains in the forward position for more than 30 to 50 seconds.

Also the warning light will come on should the fuse blow or a malfunction occur in the power supply system.

The control circuit solenoid is functioned through one cycle each time the ignition key is turned to the **ON** position. When this cycle occurs an audible click, and a cycling sound may be heard.

2 TESTING

FUNCTIONAL TEST

After it has been determined that the difficulty is in the anti-skid control system, the engine idle speed, vacuum level and standard brake system must be verified to be within the limits of the service specifications before proceeding with the standard testing. **A road test should be made only when the operator is sure that the brakes will stop the vehicle.**

The following functional test of the anti-skid control and hydraulic system may be used to determine if the system is operating and should be made after repairs, to verify correct system operation.

1. Turn the ignition key **ON**, listen for the solenoid click, and actuator cycle.
2. Position the vehicle on a hoist and raise the rear wheels to clear the floor.
3. Start the engine and warm up until normal operating temperature is reached.
4. Place the transmission in the **Drive** position and accelerate to approximately 25 to 30 mph. If only

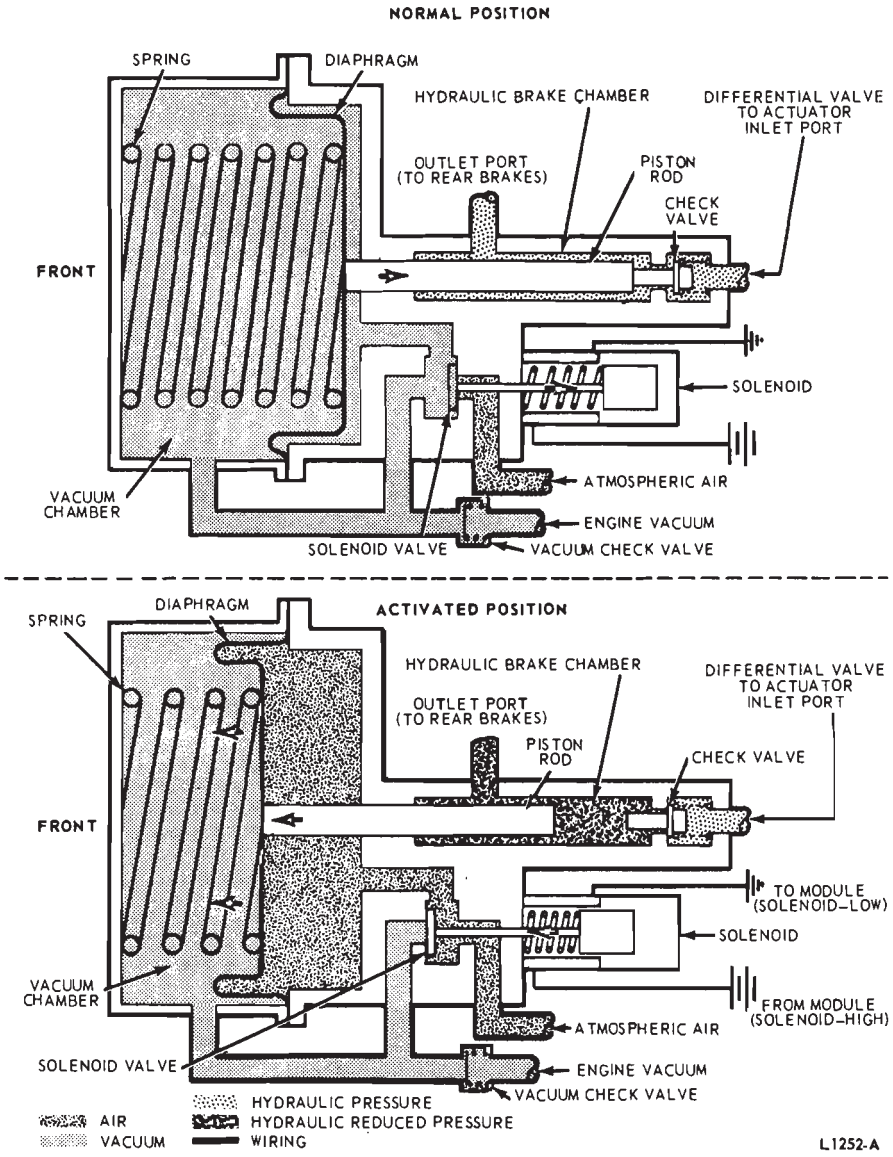

FIG. 5—Anti-Skid Control Actuator Schematic

one wheel revolves, the driven wheel will attain a speed of 50 to 60 mph. If both rear wheels revolve simultaneously, it may be necessary to increase the engine speed slightly to obtain sufficient cycling of the anti-skid control system for easier observation of the system operation. **Never exceed 60 mph speedometer indication.**

5. Apply the brakes quickly and firmly and observe the rear wheels. If the anti-skid control system is functioning properly, it will cycle 5 or 6 times or cycle until the brake pedal is released.

ELECTRICAL CONTROL SYSTEM

Electrical power is provided to the anti-skid control system when the ignition switch is turned ON. Circuit protection is provided by a 3-ampere fuse located in the fuse panel. Refer to Group 36.

Do not use a fuse of higher rating than a 3-ampere(8AG3) to prevent damage to the control module.

SENSOR TEST

1. Using the special tool (Fig. 6), remove the sensor plugs from the control module (plugs **C** and **E**, Fig. 7). **Be sure to calibrate the ohmmeter ARE 27-42 to the scale being used.**

2. Connect the ohmmeter between the two contacts of either sensor lead (Fig. 7). Resistance should be 1600-3200 ohms. **For additional testing procedures, refer to the Car Electrical Diagnosis Manual.**

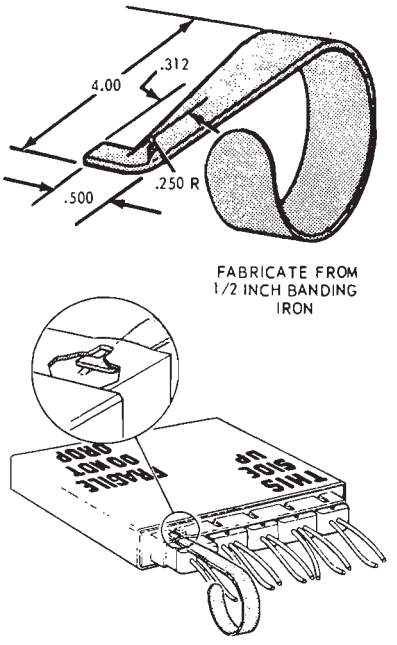

FIG. 6—Harness Connector Removal

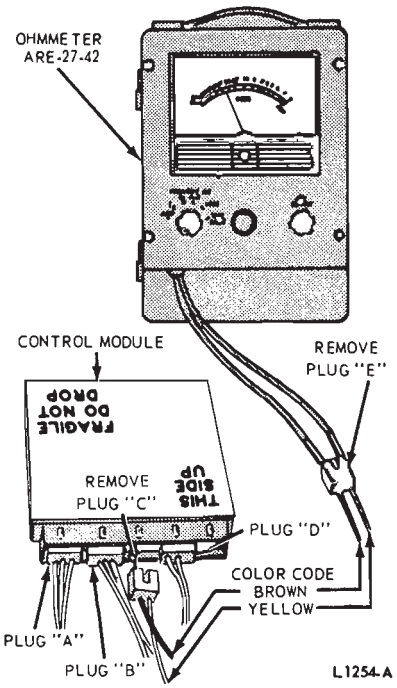

FIG. 7—Testing Sensors

SOLENOID TEST

1. Using the special tool (Fig. 6), remove the solenoid plug **A** and **B** from the control module (Fig. 8). By removing plug **B** the system grounds are eliminated and an accurate **A** resistance reading is obtained. **Be sure to calibrate the ohmmeter ARE 27-42 to the scale being used.**

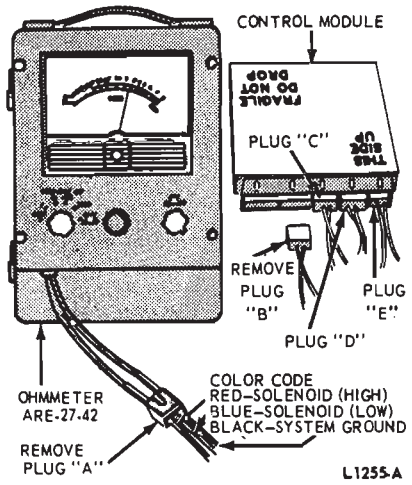

FIG. 8—Testing Solenoid Circuit

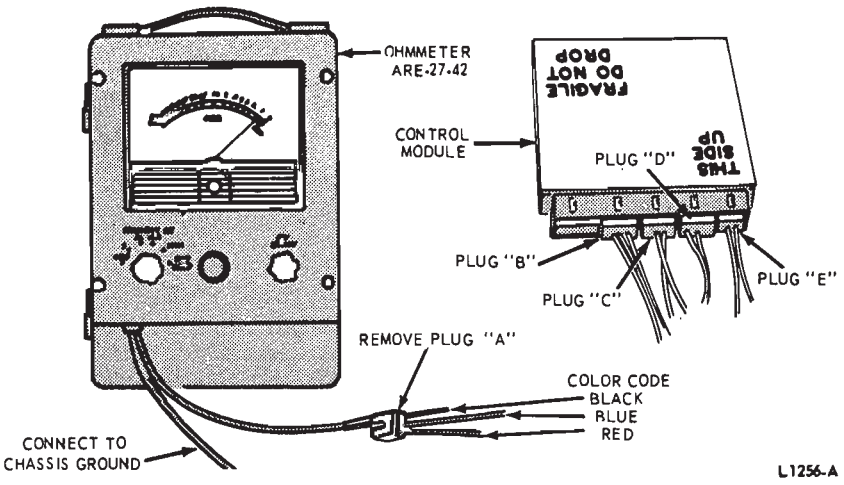

FIG. 9—Testing System Ground

2. Connect the ohmmeter between the solenoid (high) and (low) contacts in plug A (Fig. 8). Resistance should be 6 ± 2 ohms. **For additional testing procedures refer to the Car Electrical Diagnosis Manual.**

SYSTEM GROUND TEST

1. Using the special tool (Fig. 6), remove the actuator solenoid plug from the module plug A (Fig. 9). **Be sure to calibrate the ohmmeter ARE 27-42 to the scale being used.**

2. Connect the ohmmeter between the system ground plug sleeve (black) and suitable chassis ground. Resistance should be 1 ohm or less. **For additional testing procedures refer to the Car Electrical Diagnosis Manual.**

3 ADJUSTMENTS

No adjustments or repairs are to be performed on the anti-skid control system. Damaged or worn parts are to be replaced.

4 REMOVAL AND INSTALLATION

ACTUATOR ASSEMBLY

REMOVAL

1. Working in the passenger compartment, under the glove box, remove the screw that attaches the forward end of the control module retainer to the support assembly (Fig. 12). Lower the forward end of the control module retainer and remove the module assembly.
2. Disconnect the actuator solenoid and warning switch harness connectors from the control module as shown in Fig. 6.
3. Remove the two wiring harness grommets from the dash panel and push the wiring harness and connectors through the openings in the dash panel (Fig. 10).
4. Working in the engine compartment loosen the hose clamp and remove the air hose from the air filter.
5. Remove the engine air cleaner. Loosen the hose clamp and remove the vacuum hose from the vacuum manifold fitting.
6. Raise the vehicle on a hoist.
7. Disconnect the exhaust pipes from the exhaust manifold and support with wire to provide access to the actuator assembly.
8. Remove the bolt retaining the actuator ground wire to the rear outer corner of the engine right bank (Fig. 10).
9. Loosen the tube nuts and disconnect the brake system hydraulic tubes from the hydraulic valve housing (Fig. 11).
10. Remove the three nuts retaining the actuator assembly to the actuator support bracket.
11. Remove the three bolts that retain the actuator support bracket to the side rail and remove the support bracket.
12. Remove the actuator assembly from the vehicle and place it on a bench.
13. Remove the air and vacuum hoses from the actuator.

INSTALLATION

1. Install the air and vacuum hoses

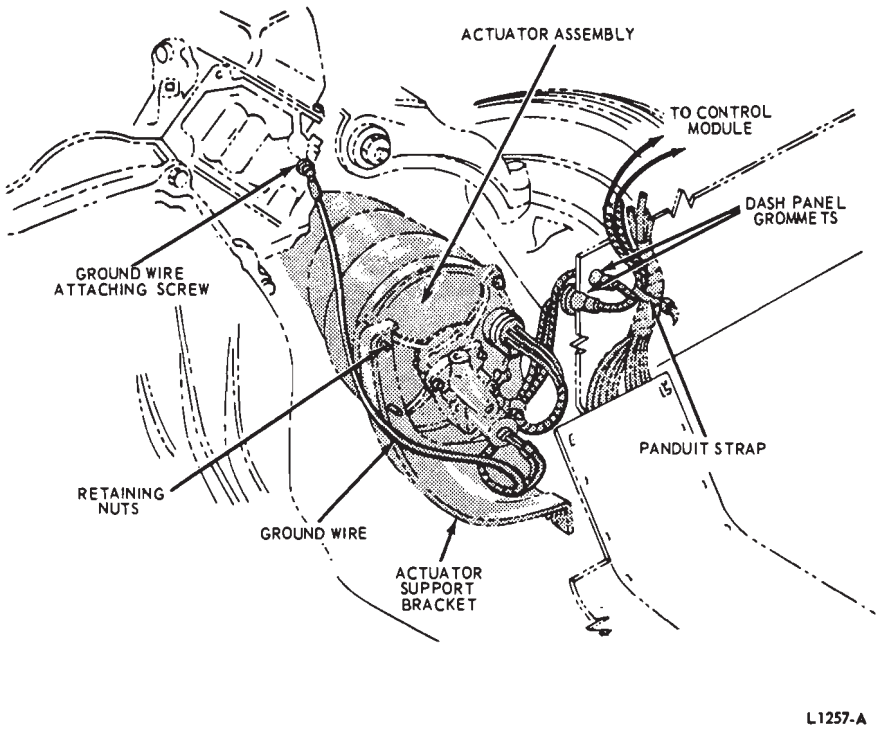

FIG. 10—Actuator Assembly Installation

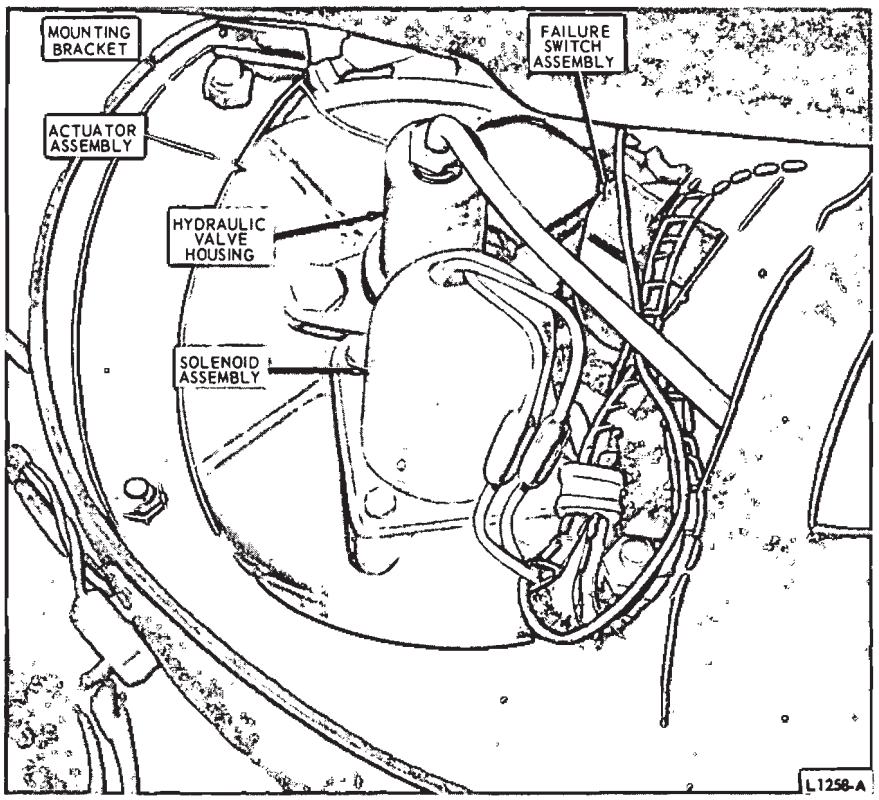

FIG. 11—Actuator Assembly Component Connections

on the new actuator.

2. Place the actuator assembly into position under the vehicle, routing the air and vacuum hoses up between the engine and fender apron and inserting the solenoid leads through the holes in the firewall.
3. Position the ground wire to the rear of the engine block and install the attaching bolt.
4. Position the actuator mounting bracket to the frame side rail and install the three retaining bolts. Torque to specifications.
5. Position the actuator assembly to the mounting bracket and install the three retaining nuts.
6. Connect the hydraulic tubes to the hydraulic valve assembly and tighten the tube nuts to specifications.
7. Connect the exhaust pipes to the exhaust manifolds.
8. Lower the vehicle.
9. Pull the actuator solenoid and brake warning switch wiring harness through the two holes in the dash panel from inside the car. Seat the wiring harness grommets in the dash panel.
10. Connect the actuator solenoid and brake warning switch wiring harness connectors to the control module.
11. Position the control module in the bracket under the glove box and install the retaining screw.
12. In the engine compartment connect the air hose to the air filter and position the hose clamp.
13. Connect the vacuum hose to the engine vacuum manifold fitting. Install the engine air cleaner.
14. Bleed the rear brake system and centralize the pressure differential valve. Refer to Part 12-01, General Brake Service.
15. Raise the rear wheels. Apply the brakes with the rear wheels turning to verify proper operation of the anti-skid control system.

CONTROL MODULE

REMOVAL

1. Remove the retaining strap holding the harnesses.
2. Remove the screw(s) that attaches the forward end of the control module retainer to the support assembly (Fig. 12).
3. Lower the forward end of the control module and retainer from the support assembly; move the module and retainer forward slightly until the flange clears the slot in the support assembly.

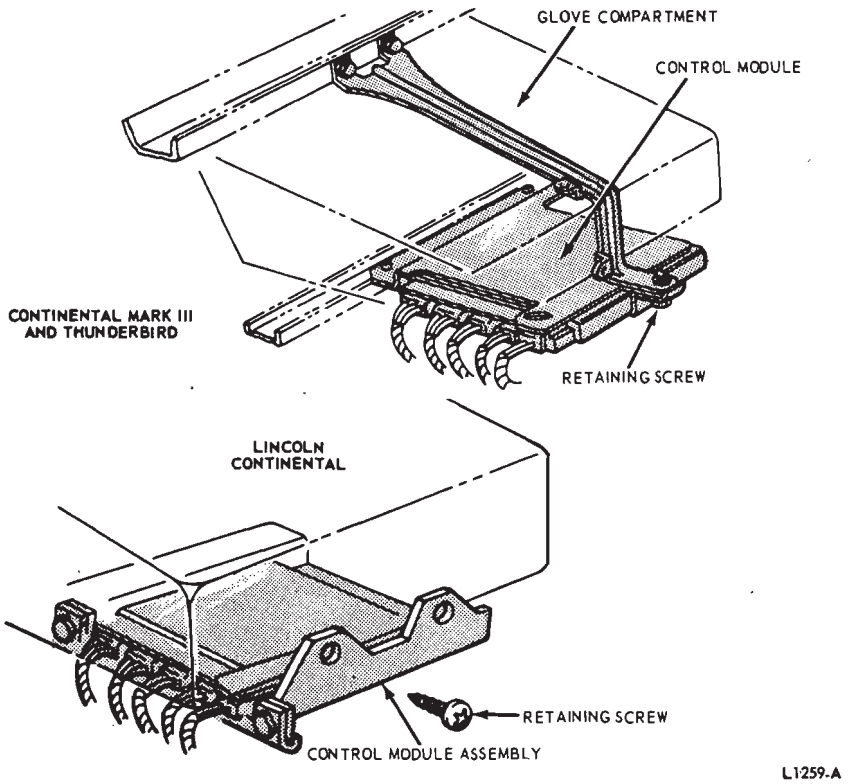

FIG. 12—Control Module Removal

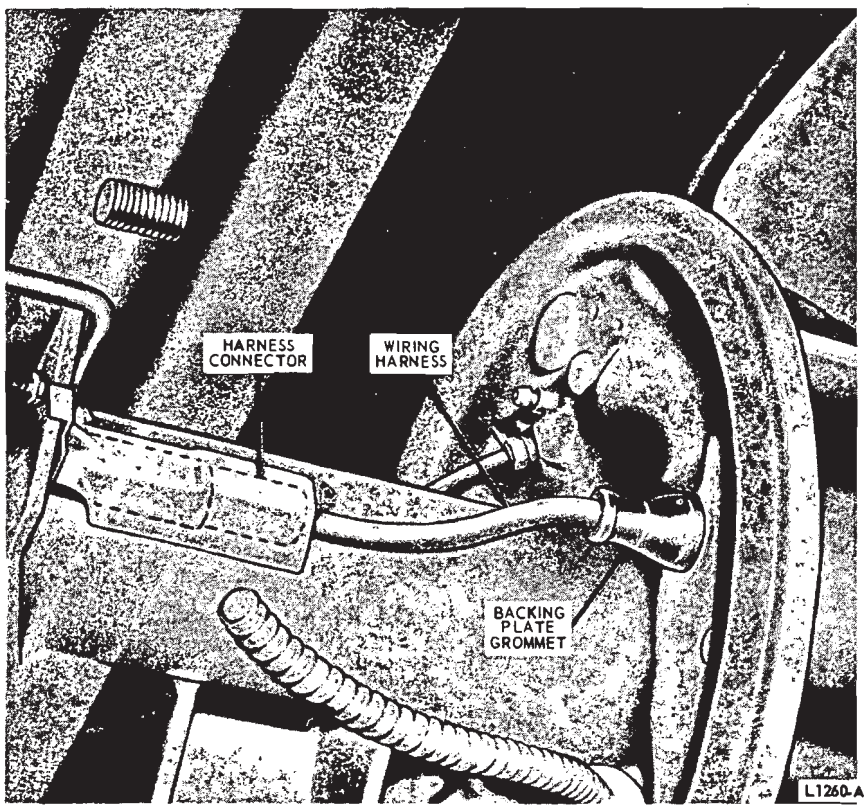

FIG. 13—Sensor Wiring Harness Connection

4. Disconnect the five wiring harenss plugs from the control module as shown in Fig. 6.
5. Remove the control module from the vehicle.

INSTALLATION

1. Connect the five wiring harness plugs to the control module. Only one arrangement is possible.
2. Position the control module in the retainer, orienting the module per the markings on it, and insert the retainer flange into the slot at the rear of the support assembly.
3. Pivot the retainer and control module upward and align the screw hole(s) in the forward end of the retainer with the hole(s) in the support bracket assembly. Install the retaining screw(s).
4. Test the vehicle on the hoist to verify correct operation of the skid control system.
5. Secure the wiring to the module support extension with the retaining strap.

SENSOR ROTOR AND STATOR ASSEMBLY

REMOVAL

1. Raise the vehicle on a hoist.
2. Remove the rear wheel and tire assembly.
3. Remove the three Tinnerman nuts (3) and remove the brake drum.
4. Disconnect the sensor lead from the rear wiring harness (Fig. 13).
5. Unseat the sensor lead grommet pushing it to the inside of the brake assembly.
6. Remove the four nuts that retain the sensor stator to the backing plate (Fig. 14) and pull the axle shaft, sensor assembly and wheel bearing assembly from the axle housing (Fig. 15).
7. Remove the wheel bearing retainer ring and press the wheel bearing retainer and wheel bearing off the axle shaft (Refer to Part 15-02).
8. Remove the sensor stator assembly and press the sensor rotor off the shaft with tool T69P-2B384-A 2 and TOOL 1225-DA (Fig. 16).

INSTALLATION

1. Press a new sensor rotor onto the axle shaft (Fig. 17) with tool T69P-2B384-A 1 and TOOL 1225-DA.

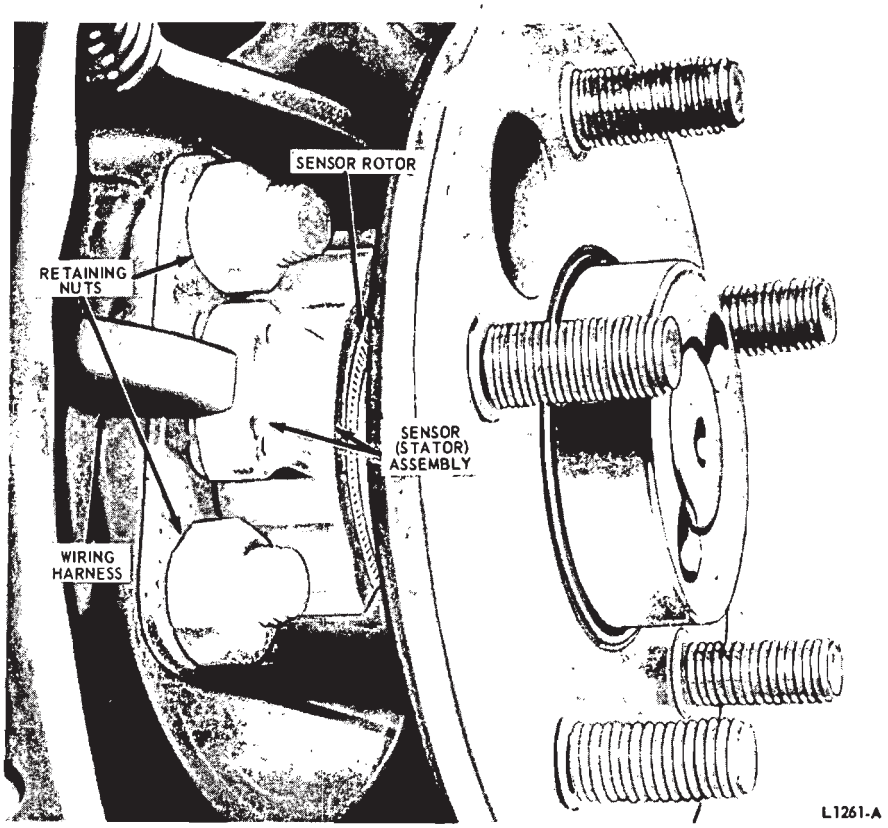

FIG. 14—Sensor Stator Assembled

2. Install the sensor stator over the rotor (Fig. 18) and press the bearing and bearing retainer onto the shaft (Refer to Part 15-02).
3. Insert the axle shaft assembly in the rear axle housing onto the four backing plate retaining bolts, feeding the sensor lead through the hole in the backing plate (Fig. 15).
4. Seat the sensor lead grommet in the backing plate.
5. Install the four nuts on the retaining bolts and tighten to specifications.
6. Connect the sensor lead to the rear wiring harness and install two retaining straps. (Fig. 13).
7. Install the rear brake drum and retain with the Tinnerman drum retaining nuts.
8. Install the rear wheel and tire assembly and tighten the wheel nuts to specifications.
9. Test the vehicle on the hoist to verify proper operation of the skid control system.

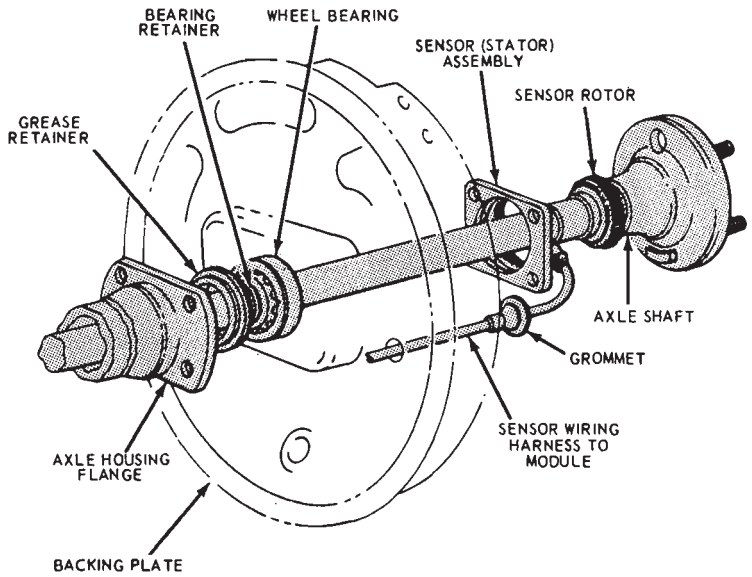

FIG. 15—Sensor Assembly Disassembled

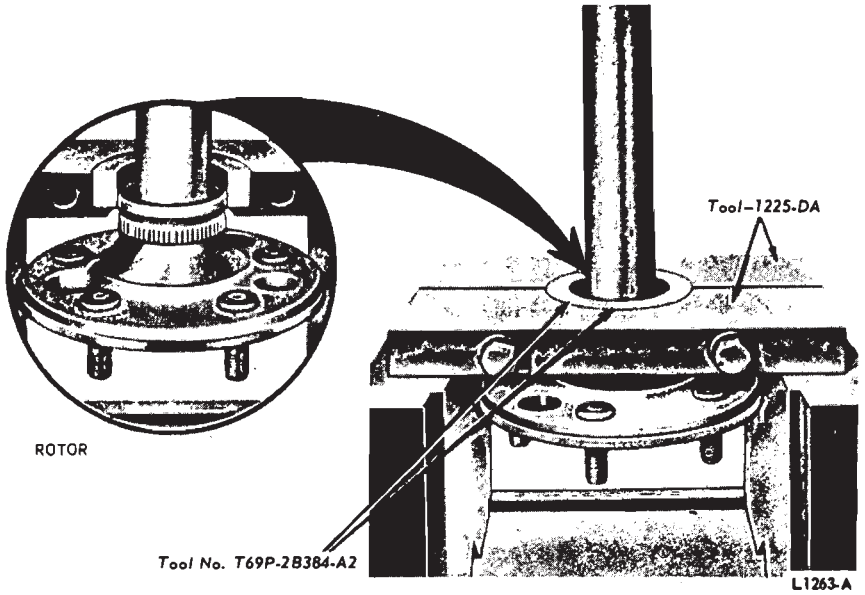

FIG. 16—Sensor Rotor Removal

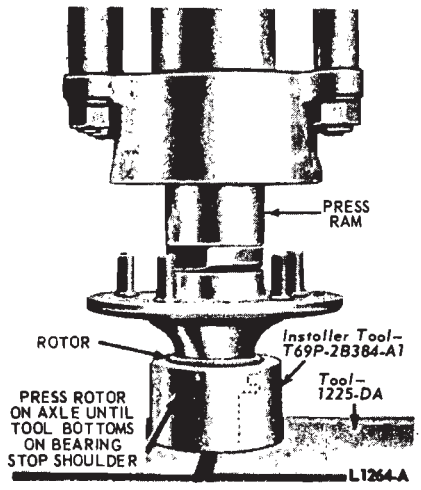

FIG. 17—Sensor Rotor Installation

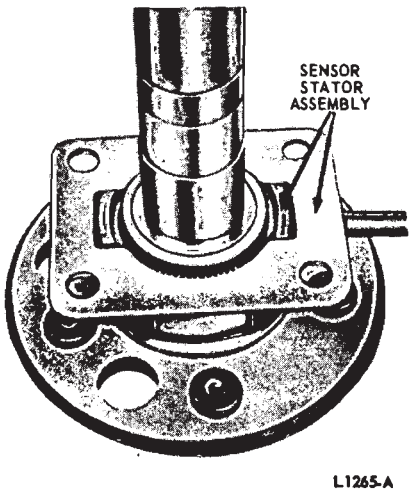

FIG. 18—Sensor Stator Assembly Installation